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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/238,262	01/27/99	SCHAEFER	J 10191/955

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EXAMINER

ALANKO, A

ART UNIT

PAPER NUMBER

1746

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DATE MAILED: 08/14/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.

09/238,262

Applicant(s)

SCHAEFER ET AL.

Examiner

Anita K Alanko

Art Unit

1746

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Rejections - 35 USC § 103

1. Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Renken et al (U.S. Patent No. 4542650).

Renken discloses a method (col.9, lines 24-32) comprising the steps of:

- providing a wafer having a surface and edge areas (“silicon substrate”);
- dividing the surface of the wafer into positive areas (areas where the oxide layer has openings), to be subsequently etched in a wet chemical etching process, and negative areas including the edge areas of the wafer;
- providing the negative areas with a passivation layer (“photoresist is applied to all sides”, exposed and developed) to protect the negative areas from the subsequent wet chemical etching process (Fig.3A);
- etching the wafer in a chemical etching process (col.9, lines 31-32); and
- removing the passivation layer (“resist is stripped”).

Renken does not disclose that the etching process is a wet chemical etching process.

Renken discloses that the etching process is an isotropic etching process. Examiner takes official notice that isotropic etching processes are conventionally wet etching processes. It would have been obvious to one with ordinary skill in the art to use a wet chemical etching process in the method of Renken because isotropic etching processes are conventionally wet chemical etching processes.

2. Claims 1-3, 5-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Renken et al (U.S. Patent No. 4542650) in view of Pearce (U.S. Patent No. 5711891).

The discussion of Renken from above is repeated here. As to claims 2-3, Renken discloses to apply an oxide layer that is structured by using a photoresist and removed in subareas after the negative areas are provided and before the wafer is etched technique (col.9, lines 30-31). Renken does not disclose that the oxide layer can be a nitride layer.

Pearce teaches that the use of nitride layers over oxide layers is advantageous in order to have more dimensional stability during etching (Fig.3-4, col.1, lines 52-67). It would have been obvious to one with ordinary skill in the art to use a nitride layer instead of an oxide layer in the method of Renken because Pearce teaches that this provides for more dimensional stability during etching.

As to claim 5, the photoresist technique of Renken is an integrated circuit photoresist technique.

As to claims 6-7, Renken discloses to strip the photoresist after the structuring step, which encompasses removing after exposing and developing.

3. Claims 1-3, 5-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iwasaki et al (U.S. Patent No. 5804090).

Iwasaki discloses a method (Fig. 15A-C) comprising the steps of:

- providing a wafer 30 having a surface and edge areas (Fig.15A);

- dividing the surface of the wafer into positive areas S2, to be subsequently etched in a wet chemical etching process, and negative areas (areas that are not to be etched) including the edge areas of the wafer;
- providing the negative areas with a passivation layer 33, 34 to protect the negative areas from the subsequent wet chemical etching process (Fig. 15A, col.26, lines 12-15);
- etching the wafer in the wet chemical etching process (Fig. 15B, col.26, lines 16-22); and

Iwasaki does not disclose to remove the passivation layer. It would have been obvious to one with ordinary skill in the art to remove the passivation layer in the method of Iwasaki because it is conventional to remove layers that are not required as a part of the final device, such as etch masks.

As to claims 2-3, Iwasaki discloses in another embodiment to form a further mask 37 in at least subareas of the positive areas (Fig. 20, col.28, lines 24-26). Iwasaki does not disclose that the mask is a nitride layer since Iwasaki does not disclose the composition of the mask 37. Iwasaki discloses that the use of silicon nitride layers as masking layers is known (col.20, line 20). Iwasaki also discloses to use silicon nitride rather than silicon oxide layers because they can be formed to smaller thicknesses which improves processing etch times in aqueous KOH (col. 3, lines 53-65); It would have been obvious to one with ordinary skill in the art to use a nitride layer as the mask 37 in the method of Iwasaki to define part of the positive areas because Iwasaki teaches that they are conventional etch mask layers.

Iwasaki does not disclose how to structure the mask to form the pattern (Fig. 19A,B). Examiner takes official notice that it is conventional in the art to pattern nitride layers by using a photoresist technique, such as an integrated circuit photoresist technique that uses exposing and

developing steps. It would have been obvious to one with ordinary skill in the art to use a photoresist technique with exposing and developing to pattern nitride layer as a mask 37 in the method of Iwasaki because it is conventional in the art.

As to claims 5-7, see the rejection of claims 2-3. Examiner takes official notice that it is conventional in the art to remove photoresist after patterning an underlying layer, such as a nitride layer. It would have been obvious to remove the photoresist after exposing and developing in the method of Iwasaki because it is conventional to remove a photoresist layer after patterning an underlying layer.

As to claim 8, Iwasaki discloses that the passivation layer 33, 34 is an oxide layer (col.26, lines 9-15).

As to claim 9, Iwasaki s discloses that the oxide layer is formed on the wafer (col.5, lines 24-25), but does not disclose that a LOCOS process is used. Examiner takes official notice that it is conventional in the art to form oxide layers by a LOCOS process. It would have been obvious to one with ordinary skill in the art to use a LOCOS process to form the oxide layer in the method of Iwasaki because it is a conventional technique for forming oxide layers.

4. Claims 1-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iwasaki et al (U.S. Patent No. 5804090) in view of O'Neill (U.S. Patent No. 5131978).

The discussion of Iwasaki from above is repeated here.

As to claim 4, Iwasaki does not disclose to apply a further passivation layer in subareas. O'Neill discloses a method for the fabrication of three dimensional structures from silicon comprising the steps of:

- providing a wafer 10 having a surface (Fig.3A);
- dividing the surface of the wafer into positive areas 20 (unmasked areas), to be subsequently etched in a wet chemical etching process, and negative areas (masked areas);
- providing the negative areas with a passivation layer 30, 32 to protect the negative areas from the subsequent wet chemical etching process (Fig.3A);
- etching the wafer in the wet chemical etching process (Fig.3D, col.5, line 53); and
- removing the passivation layer (Fig.3F, col.6, lines 25-27).

O'Neill discloses to divide the wafer into positive and negative areas by:

- applying a nitride layer 30 (col.5, line 5); and
- structuring the nitride layer 18 using a photoresist technique (col.5, line 11) so that the positive areas are defined by a part of the surface covered with the nitride layer;
- removing the nitride layer at least in subareas of the positive areas (where channel 20 is to be etched), after the negative areas are provided and before the wafer is etched (Fig.3B);
- applying a further passivation layer 38 (col.5, lines 26-28) in the subareas, after the removal of the nitride layer 30 in the subareas and before the wafer is etched; and
- completely removing the nitride layer (Fig.3F).

It would have been obvious to one with ordinary skill in the art to apply a further passivation layer and to remove the nitride layer in the method of Iwasaki as taught by O'Neill because O'Neill teaches that this is a conventional technique for patterning three dimensional structures in silicon by etching.

Response to Amendment

5. The 35 U.S.C. 112, second paragraph rejection and claim objection are withdrawn.
6. Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Renken et al (U.S. Patent No. 4542650). Claims 1-3, 5-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Renken et al (U.S. Patent No. 4542650) in view of Pearce (U.S. Patent No. 5711891). Claims 1-3, 5-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iwasaki et al (U.S. Patent No. 5804090). Claims 1-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iwasaki et al (U.S. Patent No. 5804090) in view of O'Neill (U.S. Patent No. 5131978).

Response to Arguments

Applicant's arguments filed 6/4/01 are not persuasive. The arguments are not commensurate in scope with the claim language. The terms "positive areas" and "negative areas" are interpreted broadly and can include any surface of the substrate.

Applicant argues that Renken does not disclose providing the edge areas with a passivation layer. However, Renken does because resist is applied to all sides of the substrate which includes edge areas.

Applicant argues that there is no teaching to divide the surface in Renken into positive and negative areas. These are inherent because masking inherently produces such surfaces on a substrate. Renken has chosen not to explicitly disclose that the areas have specific names such as "positive" or "negative", however they are present.

Applicant argues that the recitation by Renken of "Photoresist is applied to all sides" includes all edges is hindsight reconstruction. Examiner does not understand how this is so since the sentence says that all sides are covered, which includes wafer edges.

Applicant argues that the wafer edge is not a negative area in Renken. Renken may not explicitly disclose that it is a negative area, however the edge is inherently present, it is covered by a mask, and thus meets the claim limitation. Note that the claim does not cite that an exposure step is initially provided whereby areas (negative areas) are exposed on which the oxide layer is formed. Thus, arguments are not commensurate in scope with the claim language.

Applicant argues that Renken teaches away because of a continuous layer. However, the claim does not cite that a continuous layer is not present. Broadly interpreted, Renken reads on the claim limitations by providing the relative surface areas.

Applicant's arguments relative to Pearce are not persuasive because Pearce is relied upon to teach the mask composition, not the process steps.

Applicant's arguments relative to Iwasaki are not persuasive. Applicant argues that Iwasaki does not disclose providing the edge areas with a passivation layer. However, Iwasaki does because resist is applied to all sides of the substrate, see the Figure cited.

Applicant argues that there is no teaching to divide the surface in Iwasaki into positive and negative areas. These are inherent because masking inherently produces such surfaces on a substrate. Iwasaki has chosen not to explicitly disclose that the areas have specific names such as "positive" or "negative", however they are present.

Applicant argues that Iwasaki teaches away by providing a silicon oxide layer on the whole surface. However, the claim does not cite that a continuous layer is not present. Broadly interpreted, Iwasaki reads on the claim limitations by providing the relative surface areas.

Applicant's arguments relative to O'Neill are also not persuasive. The same arguments apply as above under Renken and Iwasaki. O'Neill may use different terminology than the applicant, but O'Neill teaches the relative surface areas.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anita K Alanko whose telephone number is 703-305-7708.

8. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Randy Gulakowski can be reached on 703-308-4333. The fax phone numbers for the organization where this application or proceeding is assigned are 703-305-7719 for regular communications and 703-305-3599 for After Final communications.

Paper No. 11

Art Unit: 1746

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Anita Alanko

Anita Alanko
Primary Examiner
Art Unit 1746

AKA
August 13, 2001